1. A downhole fluid separator comprising:

a housing adapted for connection to a tool string;

a cylinder rotatably disposed in the housing and defining a flow passage therein; and

a motor disposed in the housing for rotating the cylinder, wherein fluid flowing through the housing enters the flow passage and is subjected to centrifugal force such that the fluid is separated into different components having different specific gravities.

2. The separator of claim 1 further comprising a flow conditioner for facilitating the separation of the fluid.

3. The separator of claim 2 wherein the flow conditioner comprises an impeller adjacent to an inlet of the cylinder for pumping fluid into the flow passage.

4. The separator of claim 3 wherein the impeller is attached to the cylinder.

5. The separator of claim 2 wherein the flow conditioner comprises a baffle disposed in the flow passage in the cylinder to reduce slippage of fluid in the rotating cylinder.

6. The separator of claim 5 wherein the baffle is one of a plurality of angularly spaced baffles.

7. The separator of claim 5 wherein the baffle extends longitudinally through the cylinder.

8. The separator of claim 2 wherein:

the cylinder defines an oil port and a sand port therein;

the flow conditioner comprises a cup disposed adjacent to an end of the cylinder;

the cup has a first lip adjacent to the oil port;

the cup has a second lip adjacent to the sand port;

the first and second lips define an annular water passage therebetween;

the first lip directs separated oil through the oil port;

the second lip directs separated sand mixed with water through the sand port; and

water is directed through the water passage.

9. The separator of claim 8 wherein the first and second lips are substantially concentric.

10. The separator of claim 2 wherein:

the motor is a variable speed motor; and

the flow conditioner comprises:

a sensor in communication with separated water discharged from the cylinder, wherein the sensor generates an oil concentration signal in response to a concentration of oil in the discharged water; and

a controller connected to the motor for varying the speed of the motor in response to the oil concentration signal compared to a predetermined desired oil concentration in the discharged water.

11. The separator of claim 10 wherein the controller is an adaptive controller.

12. The separator of claim 10 wherein the controller is a PID controller.

13. The separator of claim 2 wherein:

the motor is a variable speed motor; and

the flow conditioner comprises:

a valve in communication with oil discharged from the cylinder to control the flow of the oil;

an actuator adapted for opening and closing the valve;

a sensor in communication with separated water discharged from the cylinder, wherein the sensor generates an oil concentration signal in response to a concentration of oil in the discharged water; and

a controller connected to the actuator, wherein the valve is actuated in response to the oil concentration signal compared to a predetermined desired oil concentration in the discharged water, such that the flow of oil from the cylinder is controlled to vary the time the fluid is in the cylinder and thereby correspondingly varying the amount of oil separated from the water.

14. The separator of claim 2 wherein:

the motor is a variable speed motor; and

the flow conditioner comprises a smart controller connected to the motor for varying the speed of the motor in response to a function of voltage and current signals from the motor compared to a predetermined desired value of a function corresponding to a water-cut.

15. The separator of claim 2 wherein the flow conditioner comprises a stator adjacent to an inlet end of the cylinder.

16. The separator of claim 15 wherein the stator comprises a plurality of vanes for starting rotation of the fluid as it enters the cylinder.

17. The separator of claim 2 wherein:

the cylinder defines a first port and a second port therein;

the flow conditioner comprises a cup disposed adjacent to a discharge end of the cylinder;

the cup has a first lip adjacent to the first port;

the cup has a second lip adjacent to the second port;

the first and second lips define an annular passage therebetween; and

a sensor is disposed adjacent to the cup for measuring the capacitance of fluid flowing thereby.

18. The separator of claim 17 wherein the sensor is a capacitance-type sensor disposed adjacent to the first lip and first port.

19. The separator of claim 17 wherein the sensor is a MEMS sensor embedded in a surface of the cup facing the annular passage.

20. The separator of claim 17 wherein capacitance data from the sensor is transmitted wirelessly using EM telemetry.

21. A downhole fluid separator comprising:

a housing adapted for connection to a tool string;

a rotating member disposed in the housing;

a motor disposed adjacent to the housing and connected to the rotating member, wherein fluid flowing through the rotating member is subjected to centrifugal force such that the fluid is separated into heavier and lighter components; and

a flow conditioner for facilitating the separation of the fluid in the rotating member.

22. The separator of claim 21 wherein the flow conditioner comprises an impeller adjacent to an inlet of a flow passage in the rotating member for pumping fluid into the flow passage.

23. The separator of claim 22 wherein the impeller is attached to the rotating member.

24. The separator of claim 21 wherein the flow conditioner comprises a baffle disposed in a flow passage in the rotating member to reduce slippage of fluid therein.

25. The separator of claim 24 wherein the baffle is one of a plurality of angularly spaced baffles.

26. The separator of claim 24 wherein the baffle extends longitudinally through the rotating member.

27. The separator of claim 21 wherein:

the rotating member defines an annular flow passage therein with an oil port and a sand port in communication with the flow passage;

the flow conditioner comprises a cup disposed adjacent to an end of the rotating member;

the cup has a first lip adjacent to the oil port;

the cup has a second lip adjacent to the sand port;

the first and second lips define an annular water passage therebetween;

the first lip directs separated oil through the oil port;

the second lip directs separated sand mixed with water through the sand port; and

water is directed through the water passage.

28. The separator of claim 27 wherein the first and second lips are substantially concentric.

29. The separator of claim 21 wherein:

the motor is a variable speed motor; and

the flow conditioner comprises:

a sensor in communication with separated water discharged from the rotating member, wherein the sensor generates an oil concentration signal in response to a concentration of oil in the discharged water; and

a controller connected to the motor for varying the speed of the motor in response to the oil concentration signal compared to a predetermined desired oil concentration in the discharged water.

30. The separator of claim 29 wherein the controller is an adaptive controller.

31. The separator of claim 29 wherein the controller is a PID controller.

32. The separator of claim 21 wherein:

the motor is a variable speed motor; and

the flow conditioner comprises:

a valve in communication with oil discharged from the rotating member to control the flow of the oil;

an actuator adapted for opening and closing the valve;

a sensor in communication with separated water discharged from the rotating member, wherein the sensor generates an oil concentration signal in response to a concentration of oil in the discharged water; and

a controller connected to the actuator, wherein the valve is actuated in response to the oil concentration signal compared to a predetermined desired oil concentration in the discharged water, such that the flow of oil from the rotating member is controlled to vary the time the fluid is in the rotating member and thereby correspondingly varying the amount of oil separated from the water.

33. The separator of claim 21 wherein:

the motor is a variable speed motor; and

the flow conditioner comprises a smart controller connected to the motor for varying the speed of the motor in response to a function of voltage and current signals from the motor compared to a predetermined desired value of a function corresponding to a water-cut.

34. The separator of claim 21 wherein the flow conditioner comprises a stator adjacent to an inlet end of the rotating member.

35. The separator of claim 34 wherein the stator comprises a plurality of vanes for starting rotation of the fluid as it enters the rotating member.

36. The separator of claim 21 wherein:

the rotating member defines a first port and a second port therein;

the flow conditioner comprises a cup disposed adjacent to a discharge end of the rotating member;

the cup has a first lip adjacent to the first port;

the cup has a second lip adjacent to the second port;

the first and second lips define an annular passage therebetween; and

a sensor is disposed adjacent to the cup for measuring the capacitance of fluid flowing thereby.

37. The separator of claim 36 wherein the sensor is a capacitance-type sensor disposed adjacent to the first lip and first port.

38. The separator of claim 36 wherein the sensor is a MEMS sensor embedded in a surface of the cup facing the annular passage.

39. The separator of claim 36 wherein capacitance data from the sensor is transmitted wirelessly using EM telemetry.